

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b> <b>C11D 1/72</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 94/21770</b> <b>(43) International Publication Date:</b> 29 September 1994 (29.09.94)
<b>(21) International Application Number:</b> PCT/US94/02746 <b>(22) International Filing Date:</b> 14 March 1994 (14.03.94) <b>(30) Priority Data:</b> 93870050.7 19 March 1993 (19.03.93) EP <b>(34) Countries for which the regional or international application was filed:</b> AT et al. <b>(71) Applicant (for all designated States except US):</b> THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> CARRIE, Michel, Jean [FR/BE]; Begonialaan 5, B-1853 Strombeek-Bever (BE). CILLEY, William, Ajalon [US/US]; 10008 Jackpine Court, Cincinnati, OH 45231 (US). GEBOES, Peter, Rosalia, Joannes [BE/BE]; Kapellestraat 230, B-2630 Aartselaar (BE). MORINI, Massimo [IT/BE]; Rue Edouard Faes 46, B-1090 Jette (BE). SCOTT, Louise, Gail [GB/BE]; Stijn Streuvelsstraat 9, B-1933 Sterrebeek (BE). VOS, Eddy, [BE/BE]; Koetsiersweg 15, B-3210 Linden (BE). WOO, Ricky, Ah-Man [US/US]; 6940 Van Gordon Road, Hamilton, OH 45011 (US).		<b>(74) Agents:</b> REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US). <b>(81) Designated States:</b> AU, BB, BG, BR, BY, CA, CN, CZ, FL, GE, HU, JP, KG, KP, KR, KZ, LK, LV, MD, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SL, SK, TJ, TT, UA, US, UZ, VN, OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> CLEANING COMPOSITIONS WITH SHORT CHAIN NONIONIC SURFACTANTS <b>(57) Abstract</b> <p>The present invention encompasses compositions comprising short chain alkoxylated alcohols as nonionic surfactants. The short chain alkoxylated alcohols provide superior cleaning compared to their homologues with longer chains as well as other benefits including, low foaming and skin mildness, and the ability to formulate concentrated compositions.</p>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

## CLEANING COMPOSITIONS WITH SHORT CHAIN NONIONIC SURFACTANTS

Technical field

The present invention relates to cleaning compositions. Although the present invention applies primarily to hard surface cleaning compositions, it may also be of interest for other cleaning compositions including dishwashing and laundry detergent compositions.

Background

A variety of cleaning compositions have been described in the art. There is a constant strive for the development of cleaning compositions with better performance in several respects. Better cleaning on all soils, including greasy soils and soap scum is of course a principal object, both for neat and diluted compositions which are often used in

the cleaning of hard surfaces. However other properties are also highly desirable, particularly mildness to the skin, the ability to remove soap scum and to produce limited suds.

All such objects can be independently achieved by using various ingredients which are generally added for a specific purpose. For instance silicone oils are typically added solely to control sudsing. Another example is the use of solvents to boost neat cleaning. While such additives meet the desired object, they also grief the cost of formulating efficient cleaning compositions.

It has now been found that certain nonionic surfactants, namely alkoxylated alcohols with a short alkyl chain in the alcohol, hereinafter short chain alkoxylated alcohols, meet the above objects. Indeed, it has been found that said short chain alkoxylated alcohols are particularly efficient in cleaning. Such short chain alkoxylated alcohols further meet the other objects of providing surfactants which are low foaming and which are mild to the skin. Another advantage is that such short chain alkoxylated alcohols are particularly suitable for formulating concentrated cleaning compositions.

EP 125 854 discloses a composition comprising 2.7% of C8EO4.8 together with 14.2% of ammonium C11.8 linear alkyl benzene sulphonate, 10.4 of ammonium C12-13 alkyl ethoxylated sulphate, 8.6% magnesium C12-13 alkyl sulphate, 4.0% coconut monoethanolamide and 9.1% ethanol and water. EP 125 854 however fails to draw the difference between long and short chain nonionic surfactants.

EP 496 188 discloses an aqueous solution comprising 3% of C8EO6 and 8% maleic acid. EP 486 188 does not draw the difference between long and short chain nonionic surfactants.

### Summary of the invention

The present invention encompasses aqueous cleaning compositions comprising a short chain alkoxyated alcohol surfactant according to the formula  $RO(A)_nH$ , wherein R is a C6 to C10 hydrocarbon chain, A is ethylene oxide or propylene oxide or mixtures thereof and n is of from 1 to 10, or mixtures thereof, and other conventional cleaning ingredients selected from anionic, cationic, zwitterionic and nonionic co-surfactants, including short chain co-surfactants, builders, solvents, bleaches and minors including dyes, perfumes, or mixtures thereof.

The present invention also encompasses such compositions in a concentrated form, the use of said surfactants for neat grease cleaning, for dilute grease cleaning and for soap scum cleaning. The present invention further encompasses the use of said surfactants as skin mild surfactants and as low foaming surfactants.

### Detailed description of the invention

In a main embodiment, the present invention encompasses aqueous compositions which comprise conventional cleaning ingredients and a short chain alkoxyated alcohol surfactant.

The short chain nonionic surfactants for use herein are alkoxyated alcohols according to the formula  $RO(A)_nH$ , wherein R is a C6 to C10 hydrocarbon chain and n, representing the average alkoxylation degree, is from 1 to 10, or mixtures thereof. R is indifferently straight or branched. A is ethylene oxide or propylene oxide or mixtures thereof. Similar nonionic surfactants which have longer R groups than those of the present invention are known in the art and are commonly used in cleaning

compositions. The present invention is based on the finding that alkoxyated alcohols with shorter R groups provide better cleaning, as well as the multiple benefits described herein.

Suitable surfactants for use herein can be readily made by condensing alcohols having the desired chain length with propylene or ethylene oxide, or mixtures thereof, as disclosed in the art for alkoxyated alcohols with longer chains. Suitable short chain alkoxyated alcohols for use herein are also commercially available from several suppliers, for instance Dehydol 04 <sup>®</sup> from Henkel (C8EO4), Mergital C4 <sup>®</sup> from Sidobre (C8EO4), and Imbentin AG/810/050 and AG/810/080 <sup>®</sup> from Kolb (respectively C8-10EO5 and C8-10EO8).

The compositions according to the present invention comprise from 0.1% to 50% by weight of the total composition of said short chain alkoxyated alcohols, preferably from 1% to 30%, most preferably from 1.5% to 20%.

The short chain alkoxyated alcohols herein are particularly suitable for the formulation of so-called concentrated cleaning compositions. Indeed, the short chain alkoxyated alcohols have a very high solubility in water, but they are also able to solubilize other conventional organic ingredients for cleaning compositions, such as perfumes. Thus, in an embodiment of the present invention, cleaning compositions are provided in a concentrated form, which only comprise from 1% to 80% by weight of the total composition of water, preferably from 30% to 70%. Such compositions typically comprise from 0.1% to 50% by weight of the total composition of said short chain alkoxyated alcohols, preferably from 5% to 30%.

Some of said short chain alcohol ethoxylates have been found to provide superior neat grease cleaning, compared to other alcohol ethoxylates with longer chains. Thus, in another embodiment, the present invention encompasses the use of said surfactants for neat grease cleaning. As used herein, neat grease cleaning means the cleaning of greasy soils, using an aqueous solution comprising at least one of the surfactants according to the present invention, within the ranges above. Greasy soils are typically found in kitchens or bathrooms.

For use in neat cleaning, and when R is in the higher range, i.e. 10, it is preferred to use lower ethoxylation degrees, typically 1 to 6. Preferred short chain alkoxyated alcohols for use in neat grease cleaning are those according to the formula hereinabove where R is a hydrocarbon chain from C6 to C8 and n is from 1 to 10. Preferred short chain alcohol ethoxylates for neat grease cleaning are the surfactants according to the formula above where R is a C6 hydrocarbon chain and n is 4 or 6 (C6EO4 and C6EO6); or R is a C8 hydrocarbon chain and n is 4 or 6 (C8EO4 and C8EO6); or R is a C8 hydrocarbon chain and n is 10 (C8EO10).

Some of the short chain alcohol ethoxylates herein have also been found to provide superior dilute grease cleaning, compared to solvents. Therefore, in a further embodiment, the present invention encompasses the use of said surfactants for dilute grease cleaning. As used herein, dilute grease cleaning means the cleaning of greasy soils using an aqueous solution comprising a surfactant according to the present invention, in the ranges described above, but which is diluted typically in 10 to 150 times its weight in water before it is used to clean the greasy soils. Dilute cleaning compositions and conditions have been described for instance in EP 503 219.



Suitable short chain alkoxylated alcohols for use in dilute grease cleaning are those according to the formula hereinabove where R is a hydrocarbon chain from C8 to C10, and n is from 1 to 10. For dilute cleaning, it has been found that for a given R group, it is preferred to use higher ethoxylation degrees. Preferred short chain alkoxylated alcohols herein for dilute grease cleaning are those according to the formula herein above where R is a C8 hydrocarbon chain and n is of from 4 to 10, preferably 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 or n is 10 (C10EO3, C10EO4, C10EO5, C10EO6, C10EO10), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-C10EO5), or n is 8 (C8-C10EO8).

Furthermore, some of the short chain alcohol ethoxylates herein have been found to be particularly efficient in cleaning soap scum, compared to other alkoxylated alcohols with longer chains. Accordingly, in a further embodiment, the present invention encompasses the use of said surfactants for cleaning soap scum. Soap scum, which is mainly found in bathroom is quite peculiar in its composition and traditionally leads detergent manufacturers to formulate specialty cleaning products for bathroom environment. The present invention is thus particularly applicable to the formulation of such specialty products.

Suitable short chain alkoxylated alcohols for use in cleaning soap scum are those wherein, in the formula hereinabove, R is a hydrocarbon chain from C8 to C10, and n is from 1 to 10. When R is in the higher range, i.e. towards 10, it is preferred to use lower ethoxylation degrees, typically 1 to 6. Preferred alkoxylated alcohols for cleaning soap scum are those where, in the formula hereinabove, R is a C8 hydrocarbon chain and n is of from 4 to 10, preferably 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 (C10EO3, C10EO4,

C10EO5, C10EO6), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-10EO5), or n is 8 (C8-C10EO8).

Furthermore, some of the short chain alcohol ethoxylates herein have been found to be of particular interest as they produce very limited sudsing or foaming compared to other alcohol ethoxylates. Accordingly, in a further embodiment, the present invention encompasses the use of said surfactants as low foaming surfactants. Low foaming surfactants are usually of interest for heavy duty laundry detergents, but also for hard surface cleaners which are designed to be used as no-rinse products in dilute form.

The surfactants within the present invention which have been found to produce low foaming are those according to the formula herein above where R is a C6 to C10 hydrocarbon chain and n is of from 1 to 10. Preferred low foaming surfactants herein are those where R is a C6 hydrocarbon chain and n is 4 or 6 (C6EO4, C6EO6); or R is a C8 hydrocarbon chain and n is 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 (C10EO3, C10EO4, C10EO5, C10EO6), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-10EO5), or n is 8 (C8-C10EO8); or mixtures thereof.

Furthermore, some of the short chain alcohol ethoxylates herein have been found to be of particular interest as they are particularly mild to the skin. Accordingly, the present invention encompasses the use of said surfactants as skin mild surfactants. Mildness to the skin is quite an advantage when formulating products which are bound to be in contact with the user's skin. Such is the case for dishwashing compositions, or hard surface cleaning compositions. Skin mildness benefits are usually advertised when they exist in a given product.

The surfactants within the present invention which have been found to be particularly mild to the skin are those according to the formula herein above where R is a C6 to C8 hydrocarbon chain and n is of from 1 to 10. Preferred surfactants are those where R is a C6 hydrocarbon chain and n is 4 or 6 (C6EO4, C6EO6), or R is a C8 hydrocarbon chain and n is 4, 6 or 10, or mixtures thereof (C8EO4, C8EO6, C8EO10).

The compositions according to the invention further comprise conventional ingredients selected from other nonionic, anionic, cationic and zwitterionic co-surfactants (from 0% to 30% by weight of the total composition, preferably from 1% to 20%), builders (from 0% to 20% by weight of the total composition, preferably from 1% to 10%), solvents (from 0% to 20% by weight of the total composition, preferably from 0% to 5%), non-hypochlorite bleaches (from 0% to 10% by weight of the total composition, preferably from 1% to 5%) and minors including dyes, perfumes, all of which are well known and extensively described in the art.

The exact formulation of the compositions according to the present invention depend on the end-use envisioned. Mixtures of the short chain surfactants according to the present invention can also be used in order to combine several benefits. Compositions according to the present invention can be formulated indifferently as alkaline and acidic hard surface cleaners, dishwashing products or laundry detergents.

The present invention will be further illustrated by the following examples.

Examples

The following compositions are made by mixing the listed ingredients in the listed proportions.

<u>Ingredients:</u>	<u>Weight %</u>				
	1	2	3	4	5
C8EO4	2.5	-	2.0	4.0	20
C8EO10	-	4.0	-	-	-
Lutensol A030 (R)	-	-	-	2.0	20
Lutensol A07 (R)	-	-	-	1.0	-
Na Paraffin Sulfonate	-	-	-	3.0	-
Fatty Acid	-	-	-	0.4	-
Citric Acid	5.5	5.5	3.0	2.0	3
Triethanolamine	1.9	1.9	-	1.0	-
MEA up to pH	-	-	-	-	7
Ammonia up to pH	3.5	3.5	2.0	-	-
NaOH up to pH	-	-	-	10.5	-
Water and minors	----- up to 100% -----				

Lutensol A030 is C13-15(E0)30

Lutensol A07 is C13-15(E0)7

MEA stands for monoethanolamine.

Compositions 1 and 2 hereinabove are particularly efficient in removing soapscum and are therefore particularly suitable as a bathroom cleaner. Composition 3 is particularly effective in providing low suds. Composition 4 is particularly effective on dilute and neat grease cleaning. Composition 5 is a concentrated composition.

What is claimed is:

1. An aqueous cleaning composition comprising a nonionic surfactant and conventional cleaning ingredients selected from anionic, cationic, zwitterionic and nonionic co-surfactants, builders, solvents, bleaches and minors including dyes, perfumes, or mixtures thereof, characterized in that said nonionic surfactant is a short chain alkoxylated alcohol according to the formula  $RO(A)nH$ , wherein R is a C6 to C10 hydrocarbon chain, A is ethylene oxide or propylene oxide, and n is from 1 to 10, or mixtures thereof, with the exclusion of compositions comprising 8% maleic acid and 3% of said short chain nonionic surfactant where R is C8 and n is 6, and with the exclusion of composition comprising 2.7% of said short chain surfactants wherein R is C8 and n is 4.8 and 14.2% of ammonium C11.8 linear alkyl benzene sulphonate and 10.4 of ammonium C12-13 alkyl ethoxylated sulphate and 8.6% magnesium C12-13 alkyl sulphate and 4.0% coconut monoethanolamide and 9.1% ethanol and water.
2. A composition according to claim 1 which comprises from 0.1% to 50% by weight of the total composition, preferably from 1% to 30%, most preferably from 1.5% to 20% of said short chain alkoxylated alcohol, or mixtures thereof.
3. A composition according to claims 1 and 2 which is in a concentrated form in that it comprises only from 30% to 70% by weight of the total composition of water, and from 5% to 30% by weight of the total composition of said short chain alkoxylated alcohol.

4. The use of a short chain alkoxyated alcohol according to the formula  $RO(A)_nH$ , wherein R is a C6 to C8 hydrocarbon chain, A is ethylene oxide or propylene oxide, and n is from 1 to 10, or mixtures thereof, for neat grease cleaning.
5. The use of a short chain alkoxyated alcohol according to the formula  $RO(A)_nH$ , wherein R is a C6 to C8 hydrocarbon chain and n is from 1 to 10, or mixtures thereof, as skin mild surfactants.
6. A composition or use according to the preceding claims wherein in said formula, R is 6 and n is 4 or 6 (C6EO4 and C6EO6); or R is 8 and n is 4 or 6 or 10 (C8EO4, C8EO6 and C8EO10); or mixtures thereof.
7. The use of a short chain alkoxyated alcohol according to the formula  $RO(A)_nH$ , wherein R is a C6 to C10 hydrocarbon chain and n is from 1 to 10, or mixtures thereof, as low foaming surfactants.
8. A composition according to claims 1-3 or use according to claim 7 wherein , in said formula, R is a C6 hydrocarbon chain and n is 4 or 6 (C6EO4, C6EO6); or R is a C8 hydrocarbon chain and n is 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 (C10EO3, C10EO4, C10EO5, C10EO6), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-10EO5), or n is 8 (C8-C10EO8); or mixtures thereof.
9. The use of a short chain alkoxyated alcohol according to the formula  $RO(A)_nH$ , wherein R a hydrocarbon chain from C8 to C10, A is ethylene oxide or propylene oxide and n is of from 1 to 10, or mixtures thereof, for dilute grease cleaning.

10.A composition according to claims 1-3 or use according to claim 9 wherein in said formula, R is a C8 hydrocarbon chain and n is of from 4 to 10, preferably 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 or 10 (C10EO3, C10EO4, C10EO5, C10EO6, C10EO10), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-10EO5), or n is 8 (C8-C10EO8).

11.The use of a short chain alkoxylated alcohol according to the formula  $RO(A)nH$ , wherein R is a hydrocarbon chain, A is ethylene oxide or propylene oxide and n is of from 1 to 10, or mixtures thereof, for soap scum cleaning.

12.A composition according to claims 1-3 or use according to claim 11 wherein in said formula, R is a C8 hydrocarbon chain and n is of from 4 to 10, preferably 4, 6 or 10 (C8EO4, C8EO6, C8EO10), R is a C10 hydrocarbon and n ranges from 3 to 6 (C10EO3, C10EO4, C10EO5, C10EO6), as well as a mixture of surfactants where R is a C10 hydrocarbon and a C8 hydrocarbon and n is 5 (C8-10EO5), or n is 8 (C8-C10EO8).

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/02746

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :C11D 1/72

US CL :252/174.21, DIG 1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 252/174.21, DIG 1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS CASIREG, WPAT (dehydol or mergital or Imbentin, and detergent and polyethylene glycol monobutyl ether; short chain nonionic)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US,A, 4,288,339 (Wilsberg) 08 September 1981, see Abstract, claims 1-7	1,2,4,5,7,9,11 --- 1,2,4,5,7,9,11
X --- Y	US,A, 4,129,514 (Caffarel et al) 12 December 1978 (see Abstract, claims 1-10, col. 2, line 22-col. 3, line 2, col. 5, lines 16-68.	1,2,4,5,7, 9,11 ----- 1,2,4,5,7,9,11
X --- Y	US,A, 4,784,798 (Geke et al) 15 November 1988, see Abstract; col. 2, lines 36-63; and claims 1-13	1,2,4,5,7, 9,11 ----- 1,2,4,5,7,9,11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

11 JUNE 1994

Date of mailing of the international search report

JUL 05 1994

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Authorized officer

PAUL LIEBERMAN

Facsimile No. (703) 305-3230

Telephone No. (703) 308-2523



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/02746

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 3,6,8,10 AND 12  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.